REMARKS

The above amendments have been made to make minor editorial changes so as to generally improve the form of the specification.

Attached hereto is a marked-up version of the changes made to the specification by the current Preliminary Amendment. The attached page is captioned "**Version With Markings to Show Changes Made**".

Respectfully submitted,

Mutsuhito KAINE et al.

By _____
Nils E. Pedersen
Registration No. 33,145
Attorney for Applicants

NEP/krl
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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formula (3)

$$v7' = -A3 \cdot \sin(2\pi x/pt) + B3$$

In formulas (1)-(3), A1-A3 are amplitudes, and B1-B3 are DC components. Here, a ratio of the amplitude to the DC component in each of v5'-v7', that is, A1/B1 (or A2/B2, A3/B3) is referred to as a modulation factor MOD. As shown in figure 6, the I-V converting units 353 and 354 are connected to a differential arithmetic unit 374 through variable gain amplifying units 476, 477 and envelope curve detecting units 356, 357, respectively. Thereby, the voltage signals v5 and v6 outputted from the I-V converting units 353 and 354 are adjusted in the variable gain amplifying units 476 and 477 such that the maximum amplitudes (A1+B1 shown in figure 6) of the periodic signals become equal to each other, and then detected as displacement signals v5' and v6' in the envelope curve detecting units 356 and 357, respectively. The displacement signals v5' and v6' are subjected to differential calculation in the differential arithmetic unit 374, and the result is outputted as a voltage signal v8. Further, the voltage signals v5 and v7 outputted from the I-V converting units 354 and 355 are adjusted in the variable gain amplifying units 478 and 479 such that the maximum amplitudes of the periodic (synchronous) signals become equal to each other, and then detected as displacement signals v5' and v7' in the envelope curve detecting units 358 and 359, respectively. The displacement signals v5' and v7'

are subjected to differential calculation in the differential arithmetic unit 375, and the result is outputted as a voltage signal v9.

The voltage signals v8 and v9 outputted from the differential arithmetic units 374 and 375 have sine waves where the respective phases differ from each other by $\pi/2$ as represented by formulas (4) and (5), respectively.

formula (4)

$$v8=A4\cdot\sin(2\pi x/pt+\pi/4)$$

formula (5)

$$v9=A4\cdot\sin(2\pi x/pt-\pi/4)$$

In formulas (4) and (5), A4 is an amplitude. The differential arithmetic units 374 and 375 are connected to an arithmetic unit 433 through the variable gain amplifying units 474 and 475, respectively. Thereby, the voltage signals v8 and v9 outputted from the differential arithmetic units 374 and 375 are adjusted to have desired amplitudes in the variable gain amplifying units 474 and 475, respectively, and thereafter, these voltage signals are added in the arithmetic unit 433 to be outputted as a voltage signal v10. The voltage signal v10 has a waveform as represented by formula (6) and is outputted from an output terminal 403 as the tracking error signal.

formula (6)

$$v10=K3\cdot A4\cdot\sin(2\pi x/pt+\pi/4)+K4\cdot A4\cdot\sin(2\pi x/pt-\pi/4)$$
$$=K3\cdot A4\cdot\sin(2\pi x/pt+\Phi 1)+K3\cdot A4\cdot\sin(2\pi x/pt+\pi/2+\Phi 1)$$